

THE MYOLOGY OF SOME PULMONATE MOLLUSCA CONSIDERED
AS A DISTINCTIVE FEATURE IN THE DISCRIMINATION OF
GENERA, ETC.

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IN the careful anatomical descriptions of not a few of Mr. Charles Hedley's valuable contributions to the anatomy of the Mollusca, I have noted that he very rightly describes the chief muscles. More recently Lieut.-Colonel H. H. Godwin-Austen, F.R.S., has stated that the position of attachment of the several retractor muscles of the generative organs, eye, etc., is of "very great importance when studying the differences between generic groups, being an internal character less liable to change than other external ones."¹

For some length of time I have noted the variations in the form, number, and position of the muscles of various species of Pulmonate Molluscs, and have resolved in my future dissections to carefully note and draw these in order to determine more exactly the importance that should be attached to the same in generic, or specific distinction.

For this purpose specimens of *Arion empiricorum*, Fér., *A. subfuscus*, Drap., *Limax maximus*, L., *Testacella scutulum*, Sby., *Helix aspersa*, Müll., and *Limnea stagnalis*, Linn., were chosen; firstly because I had already made numerous notes and drawings of the muscular system of many, and secondly since they are all common and widely distributed forms, so that it is open for other workers to confirm, amend, or add to the following account.

Malacologists now, more than ever, seem agreed that wherever possible the distinctions of both genera and species should rest upon something more than the colour or form of a shell, or the external markings of the animal. There is hardly a system of organs in the Mollusca which has not at some time or other been advanced as a basis for the classification and division of the various families, genera, and species. The nervous, generative, respiratory, vascular and digestive systems have all found supporters, but the myology seems to have been entirely overlooked. I do not for a moment support the classification, or division, of any group of animals upon the morphology of a single system of organs, but think it necessary that we should know the actual value of each system, in order that we may more accurately judge of its importance in the aggregate characters of the animal or group of animals.

¹ Proc. Malac. Soc. 1893, vol. i. p. 8.

At the very outset of my investigations I soon found, what nearly all workers in other groups have noticed, viz. that the muscles which do not supply either sense or other important organs are subject to great variation in form, size, position, etc. Having noted this, the actual scope of my investigations resolved itself into a comparatively simple series of observations upon the following muscles:—

1. *The buccal retractor muscle.*
2. *The tentacular retractor muscles.*
3. *The genital retractor muscles.*

1. THE BUCCAL RETRACTOR MUSCLE.

In the genus *Arion* this muscle arises on the right side of the posterior portion of the mantle; passing forward it divides into two equal branches, each of which diverges laterally, and is attached to the sides of the buccal cavity. An examination was made of thirty specimens from various localities, but no variations were found.

In *Limax* this muscle arises in the posterior median portion of the mantle and passes forward, giving off the tentacular retractors. It divides into two branches, as in *Arion*, only the division is more anterior, each branch passing to the sides of the buccal cavity. Twenty-five specimens were examined, but no variations were found in any.

A similar series of *Helix aspersa*, Müll., were examined, no one of which showed any variation.

2. THE TENTACULAR RETRACTOR MUSCLES.

In *Arion* these muscles arise on the posterior and lateral border of the mantle as two small bundles of fibres, which, passing forward, unite; this, however, is not a true union, the two muscles remaining quite distinct. At the anterior border of the mantle they divide again. The inner (inferior) one supplies the lower tentacle, and the outer (superior) the upper tentacle. A small inner and dorsal branch is given off from the superior retractor, which joins with a similar but larger one from the inferior retractor, the two passing around and above the mandible on either side. These smaller branches were found in a few cases to vary slightly.

The tentacular retractors in *Limax* are the same as in *Arion*, excepting that they arise as one from the buccal retractor. No variations were found.

3. THE GENITAL RETRACTOR MUSCLES.

These are a group of muscles supplying the oviduct receptaculum seminis and duct, sperm duct, and penis. The form, position, and branching of these have been carefully noted in a very large series of each of the genera named.

In *Arion* numerous variations were found, and one or two of the more important may be mentioned. In one case, an example of *A. subfuscus*, the retractor muscle supplying the oviduct had its point of origin 15 millimetres posterior to the mantle; another, *A. empiricorum*, had its point of origin much anterior to the position of attachment to the oviduct, and in examples of the same species

it was frequently found that this muscle arose from two quite independent points. In all the specimens of *A. lusitanicus*, Mab.,¹ which I have examined I have found the position quite constant.

In *Limax*, *Testacella*,² and *Helix* similar variations were not uncommon.

In *Limnæa stagnalis*, L., the variations, while not important, were very numerous. Bandelot,³ in his beautiful drawings of the generative anatomy of this species, figures three groups of retractor muscles which spread themselves out along the penis and its appendix, and may be readily divided into seven distinct muscles. Specimens very similar to this have been seen by the writer, and also others in which there were but two distinct muscles, these being attached to the lower portion of the appendix.

From an examination of a fairly representative series of each of the species previously mentioned I may briefly summarise my results as follows :—

1. No variation whatever was found in the form, number, or position of the buccal retractor muscles.
2. The tentacular retractor muscles are quite as constant, very slight variations only being found in the labial branches.
3. While the genital retractor muscles may be constant in some genera, in *Arion*, *Testacella*, *Limax*, *Helix*, and *Limnæa* innumerable variations were found.
4. No great *specific* value can be attached to the myology in the above-mentioned genera, and its *generic* value is probably much less than that of the nervous, generative or digestive systems in the Pulmonate Mollusca generally.

¹ The Conchologist, 1892, vol. ii. p. 59.

² Annals and Mag. N.H. 1893 (ser. vi.), vol. xii. p. 24.

³ Recherches sur l'appar. Gen. d. Moll. Gastérop. 1863, pl. iv. fig. 1.